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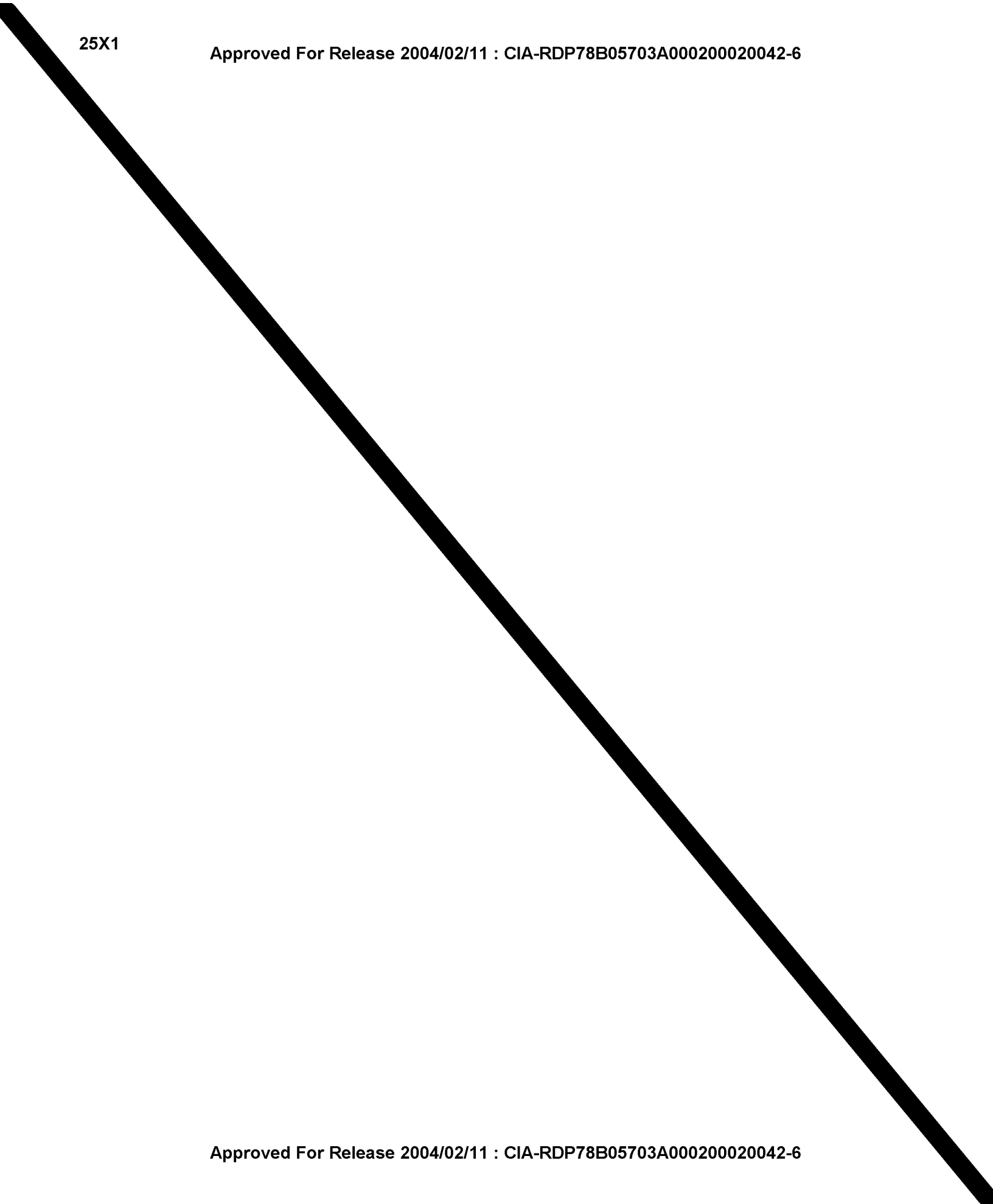

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27 OCT 1969

MEMORANDUM FOR : Deputy Director for Intelligence

SUBJECT : Continuation of [redacted] Contract. 25X1
"Digital Image Manipulation," at a Cost of [redacted] 25X1

1. This memorandum requests approval for the commitment of funds for the subject contract. The specific request is stated in paragraph 7.

2. a. Imagery produced by the various operational acquisition systems is frequently degraded as a result of errors in camera focus, inadequate image motion compensation, incorrect exposure, and other system malfunctions. While no exact measure of how often this occurs is available, it is known that some individual problems of this sort are experienced on each mission. Similar problems are frequently encountered in images recorded clandestinely by attaches, agents, etc. Under these circumstances there is seldom an opportunity to reshoot the event concerned, and because of the poor image quality, the amount of information that can be extracted is severely reduced. In addition, since the Digital Image Manipulation system is designed to digitally encode an optical image, modify and enhance that image in a computer, and then subsequently reconstitute the image in a visual form, it is conceivable that the techniques derived from the program could be directly applicable to future Near-Real-Time systems.

b. Methods aimed at enhancing these degraded images have been the subject of extensive research by the Visibility Laboratory of the [redacted] 25X1. Recently, digital techniques for improving images degraded in the laboratory have been developed and demonstrated. The application of these new techniques to operational imagery should result in a significant and otherwise unobtainable increase in the amount of information extracted.

3. a. The proposed project will extend the general digital image manipulation techniques developed under the previous portions of this research contract, to specific degraded images encountered under operational circumstances. The project will be executed in three phases: (1) design controlled experiments, using both trained interpreters and non-interpreters as a control group, to determine whether

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GROUP 1
Excluded from automatic downgrading and declassification

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nd, if applicable, to what extent additional information can be extracted from imagery which has been manipulated as opposed to that which has not been manipulated; (2) perform initial experiments on unclassified high resolution images which simulate operational conditions; (3) perform experiments with operational images and NPIC P.I.'s to determine whether the amount of information gained from digitally enhanced imagery is of significant value to justify the further development.

b. Phase (1) will be largely accomplished during the first quarter of the contract (Nov 69-Jan 70). It will provide the essential procedures and basic experimental parameters required for the subsequent phases.

c. Phase (2) will be accomplished during the period January-July 70. Samples of simulated imagery on operational film -- processed using both single and dual-gamma chemistry--will be employed to determine any software refinements which are peculiar to high resolution images. (Dual-gamma is processing technique designed to increase contrast in low-contrast areas while at the same time decreasing contrast in high-contrast areas in order to allow more information to be extracted from the imagery; single processing lacks this feature of compensating for both high and low contrast in the same imagery. A considerable amount of current imagery is now processed using the dual-gamma method; extensive use of dual-gamma processing is anticipated in the future.) The impact of the dual-gamma mode of processing on the image manipulation process will be converted for use on the IBM 360/44 computer to be installed at the [redacted] during this period (at no additional expense to NPIC).

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d. Phase (3) will occur during August-October 70. It consists of two parts. Part one, data collection, will involve experiments with operational imagery at NPIC. Part two includes data analysis and report preparation; this part will occur largely at the contractor's laboratory.

e. The results of the experiments performed under previous portions of this contract have demonstrated conclusively that certain images can be manipulated from a degraded to a much improved state. The risk encountered in the proposed project involves the accuracy of the prediction that the techniques can be successfully applied to the more complex operational images. While theory and technology support this hypothesis, it has not been tested and there is no guarantee of success. This fact notwithstanding, the potential pay-off is highly significant and the proposed project is considered to be worth the low risk involved.

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f. Deliverable items include quarterly reports of progress, special technical reports concerning the theory and the concepts applied, the software developed, and a detailed final report.

4. a. The proposed contract is a logical follow-on to work previously performed for NPIC by the [redacted] 25X1
25X1 [redacted]

b. A Zoom 70 microscope will be required at GFE during the entire period. The unit is available.

c. The conduct of the proposed work involves support from NPIC/IEG and DD/S&T/ORD. The former will provide P.I.'s for the Phase three experiments. The latter will provide the input/output equipment for the in-house experiments, Phase three. The necessary coordination has already been affected.

5. In summary, the purpose of this research is to provide NPIC with data sufficient for determining whether or not we should proceed toward an operational capability. This determination will be made in late 1970 or early 1971. If the recommendation at that time is to proceed, then an accompanying recommendation will be considered and made concerning how to proceed--through contracted development work, an in-house effort, or a combination of those.

25X1 6. The sterility code [redacted] is appropriate for the contract and all of the work performed at the contractor's laboratory. The project officer will assign security classifications to reports and that portion of the work performed at NPIC.

7. The attached proposal is for [redacted] However, additional travel and per diem by the contractor will be necessary during the in-house phase of the proposed work; hence, an additional [redacted] will be required. It is therefore requested that the negotiation with the 25X1 [redacted] for a contract to conduct the program described at a cost not to exceed [redacted] be approved. 25X1

[redacted] 25X1

ARTHUR C. LUNDAHL
Director
National Photographic Interpretation Center

Attachments: (3) 25X1
1. Proposal
2. Memorandum, dated 11 Sep 69
3. Form 2420

[redacted]

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APPROVED: _____

for R. J. SMITH
Deputy Director for Intelligence

3 DEC 1969
Date

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